

CLAIMS

1. An apparatus for administering percutaneous electrical therapy to a recipient, comprising:

2 a housing supporting a percutaneous electrode in position to penetrate a skin
3 surface of the recipient; and

4 a releasable attachment member having a first portion connected to the
5 housing, the attachment member further having a second portion with an attachment surface
6 facing away from the housing to engage and attach to the skin surface, the second portion
7 being coupled to the first portion with a releasable bond, and wherein a strength of the
8 releasable bond is less than a tear strength of the first portion and less than a tear strength of
9 the second portion.

1 2. The apparatus of claim 1 wherein the first and second portions of the
2 attachment member are formed integrally with each other and wherein the releasable bond
3 includes perforations between the first and second portions.

1 3. The apparatus of claim 1 wherein the releasable bond includes a
2 plurality of connecting portions arranged along a line between the first and second portions,
3 the connecting portions being separated by interstitial spaces.

1 4. The apparatus of claim 1 wherein the releasable bond includes a
2 plurality of connecting portions arranged along a line between the first and second portions,
3 the connecting portions being separated by interstitial spaces, the connecting portions being
4 formed integrally with the first and second portions of the attachment member.

1 5. The apparatus of claim 1 wherein the attachment member includes a
2 plurality of layers, the first portion having a first plurality of layers, the second portion
3 having a second plurality of layers, and the releasable bond having a third plurality of layers
4 with the third plurality being less than the first plurality and less than the second plurality.

5 6. The apparatus of claim 1 wherein the first portion includes a first
6 material, the second portion includes a second material and the releasable bond includes a
7 third material different than the first and second materials.

8 7. The apparatus of claim 6 wherein the first the first and second materials
9 are the same.

10 8. The apparatus of claim 1 wherein the housing includes a generally
11 cylindrical portion in which the percutaneous electrode is positioned, the housing further
12 including a flange extending radially outwardly from the generally cylindrical portion toward
13 one end of the generally cylindrical portion, and wherein the first portion of the attachment
14 member is adhesively bonded to the flange and the second portion of the adhesive member is
15 positioned radially outwardly from the first portion.

1 9. The apparatus of claim 1 wherein the first and second portions are
2 formed integrally with each other and have a first thickness in a direction generally normal to
3 the engaging surface, and wherein the releasable bond is formed integrally with the first and
4 second portions and has a second thickness in a direction generally normal to the engaging
5 surface, the second thickness being less than the first thickness.

1 10. The apparatus of claim 1 wherein the housing has a generally cylindrical
2 portion and the releasable bond defines a generally arcuate bond line concentric with the
3 generally cylindrical portion.

1 11. The apparatus of claim 1 wherein the second portion of the attachment
2 member includes a tab having a non-adhesive surface to remain detached from the skin
3 surface when the attachment surface of the attachment member is engaged with the skin
4 surface.

1 12. The apparatus of claim 1 wherein the second portion of the adhesive
2 member includes a tab having a non-adhesive surface to remain detached from the skin

3 surface when the attachment surface of the attachment member is engaged with the skin
4 surface, the non-adhesive surface being generally co-planar with the adhesive surface.

1 13. The apparatus of claim 1 wherein the attachment surface includes an
2 adhesive to attach to the skin surface when the attachment surface is engaged with the skin
3 surface.

4 14. The apparatus of claim 13, further comprising a cover sheet releasably
5 attached to the adhesive.

1 15. The apparatus of claim 1 wherein the attachment member includes a
2 compressible material.

1 16. The apparatus of claim 1, further comprising the percutaneous electrode,
2 and wherein the percutaneous electrode is movable relative to the housing between a first
3 position with the percutaneous electrode located within the housing and a second position
4 with the percutaneous electrode at least partially external to the housing to penetrate the skin
5 surface, and wherein the apparatus still further comprises a stop member coupled to the
6 housing and moveable relative to the housing between a non-restricting position and a
7 restricting position, the stop member being operatively decoupled from the percutaneous
8 electrode when in the non-restricting position to allow axial motion of the electrode, the stop
9 member being positioned to at least restrict axial motion of the percutaneous electrode when
10 the stop member is in the restricting position.

1 17. The apparatus of claim 1 wherein the housing has a generally cylindrical
2 casing with an aperture extending through the casing, and wherein the housing has at least
3 one guide channel, and wherein the apparatus further comprises:

4 a slider member supporting the percutaneous electrode and having at least one
5 guide portion received in the guide channel, the slider member being movable relative to the
6 housing to move the percutaneous electrode between a first position with the percutaneous
7 electrode located within the housing and a second position with the percutaneous electrode at
8 least partially external to the housing to penetrate the skin surface; and

9 a stop member connected to the attachment member and moveable relative to
10 the housing between a non-restricting position and a restricting position, the stop member
11 being disengaged from the slider member when in the non-restricting position to allow axial
12 motion of the electrode between the first and second positions, the stop member being axially
13 aligned with the slider member when in the restricting position to at least restrict motion of
14 the percutaneous electrode away from the second position, the stop member having a tab
15 portion positioned to be engaged by a human digit for movement between the non-restricting
16 and the restricting position, the stop member further including an engaging portion
17 positioned in the aperture of the casing, the engaging portion being generally co-planar with
18 the casing when the stop member is in the non-restricting position, the engaging portion
19 being positioned inwardly of the casing and aligned with the slider member when the stop
20 member is the restricting position.

1 18. An apparatus for administering percutaneous electrical therapy to a
2 recipient, comprising:

3 a support housing having an engaging surface positioned to engage a skin
4 surface of the recipient;

5 a percutaneous electrode moveably supported relative to the support housing
6 and moveable relative to the support housing toward and away from the engaging surface
7 between a first position with the electrode a first distance from the engaging surface and a
8 second position with the electrode a second distance away from the engaging surface; and

9 an adhesive member having a first portion connected to the support housing,
10 the adhesive member further having a second portion with an adhesive surface facing away
11 from the housing to engage the skin surface, the second portion being coupled to the first
12 portion with a releasable bond, and wherein a strength of the releasable bond is less than a
13 strength of the first portion and less than a strength of the second portion, with the adhesive
14 member preferentially separating at the releasable bond when a first force is applied to the
15 first portion and a second force at least partially opposing the first force is applied to the
16 second portion.

1 19. The apparatus of claim 18 wherein the first and second portions of the
2 adhesive member are formed integrally with each other and wherein the releasable bond
3 includes perforations between the first and second portions.

1 20. The apparatus of claim 18 wherein the releasable bond includes a
2 plurality of connecting portions arranged along a line between the first and second portions,
3 the connecting portions being separated by interstitial spaces.

1 21. The apparatus of claim 18 wherein the releasable bond includes a
2 plurality of connecting portions arranged along a line between the first and second portions,
3 the connecting portions being separated by interstitial spaces, the connecting portions being
4 formed integrally with the first and second portions of the adhesive member.

1 22. The apparatus of claim 18 wherein the support housing includes a
2 generally cylindrical portion in which the percutaneous electrode is positioned, the housing
3 further including a flange extending radially outwardly from the generally cylindrical portion
4 toward one end of the generally cylindrical portion, the flange carrying the engaging surface,
5 and wherein the first portion of the attachment member is adhesively bonded to the flange
6 and the second portion of the adhesive member is positioned radially outwardly from the first
7 portion.

1 23. The apparatus of claim 18 wherein the second portion of the adhesive
2 member includes a tab having a non-adhesive surface to remain detached from the skin
3 surface when the adhesive surface of the attachment member is attached to the skin surface.

1 24. The apparatus of claim 18, further comprising a stop member coupled to
2 the housing and moveable relative to the housing between a non-restricting position and a
3 restricting position, the stop member being operatively decoupled from the percutaneous
4 electrode when in the non-restricting position to allow axial motion of the electrode between
5 the first and second positions, the stop member being positioned to at least restrict motion of

6 the percutaneous electrode away from the second position when the stop member is in the
7 restricting position.

1 25. An apparatus for administering percutaneous electrical therapy to a
2 recipient, comprising:

3 a support housing having an engaging surface positioned to engage a skin
4 surface of the recipient;

5 a percutaneous electrode moveably supported relative to the support housing
6 and moveable relative to the support housing along an axis toward and away from the
7 engaging surface between a first position with the electrode a first distance from the engaging
8 surface and a second position with the electrode a second distance away from the engaging
9 surface, the electrode being moveable transverse to the axis relative to the support housing
10 only when the probe is in the second position; and

11 an adhesive member having a first portion connected to the support housing,
12 the adhesive member further having a second portion with an adhesive surface facing away
13 from the housing to engage the skin surface, the second portion being coupled to the first
14 portion with a releasable bond, and wherein a strength of the releasable bond is less than a
15 strength of the first portion and less than a strength of the second portion, with the adhesive
16 member preferentially separating at the releasable bond when opposing forces are applied to
17 the first and second portions.

1 26. The apparatus of claim 25 wherein the first and second portions of the
2 adhesive member are formed integrally with each other and wherein the releasable bond
3 includes perforations between the first and second portions.

1 27. The apparatus of claim 25 wherein the support housing includes a
2 generally cylindrical portion in which the percutaneous electrode is positioned, the housing
3 further including a flange extending radially outwardly from the generally cylindrical portion
4 toward one end of the generally cylindrical portion, the flange carrying the engaging surface,
5 and wherein the first portion of the attachment member is adhesively bonded to the flange
6 and the second portion of the adhesive member is positioned radially outwardly from the first
7 portion.

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1 28. The apparatus of claim 25 wherein the second portion of the adhesive
2 member includes a tab having a non-adhesive surface to remain detached from the skin
3 surface when the adhesive surface of the adhesive member is attached to the skin surface.

1 29. The apparatus of claim 25, further comprising a stop member coupled to
2 the housing and moveable relative to the housing between a non-restricting position and a
3 restricting position, the stop member being operatively decoupled from the percutaneous
4 electrode when in the non-restricting position to allow axial motion of the electrode between
5 the first and second positions, the stop member being positioned to at least restrict motion of
6 the percutaneous electrode away from the second position when the stop member is in the
7 restricting position.

1 30. The apparatus of claim 25 wherein the housing has a base and a
2 receiving cylinder, and wherein the apparatus further comprises:

3 a sleeve positioned in the receiving cylinder and rotatable about the axis; and
4 a slider member supporting the percutaneous electrode in a position parallel to
5 and offset from the axis, the slider member being slideable relative to the sleeve and the
6 housing along the axis.

1 31. An apparatus for administering percutaneous electrical therapy to a
2 recipient, comprising:

3 a support housing having a casing defining an axial direction, the casing having
4 an engaging surface at one end positioned to engage a skin surface of the recipient;

5 a percutaneous electrode moveably supported relative to the support housing
6 and moveable relative to the support housing in the axial direction toward and away from the
7 engaging surface between a first position a first distance from the engaging surface and a
8 second position a second distance from the engaging surface greater than the first distance;
9 and

10 a stop member coupled to the housing and moveable relative to the housing
11 between a non-restricting position and a restricting position, the stop member being
12 operatively decoupled from the percutaneous electrode when in the non-restricting position

13 to allow axial motion of the electrode between the first and second positions, the stop
14 member being positioned to at least restrict motion of the percutaneous electrode away from
15 the second position when the stop member is in the restricting position.

1 32. The apparatus of claim 31 wherein the casing of the housing has a
2 generally cylindrical shape with an aperture extending through the casing and wherein the
3 percutaneous electrode is supported by a slider member that is movable relative to the
4 housing to move the percutaneous electrode between the first and second positions, and
5 wherein the housing includes an adhesive member positioned to engage the skin surface, still
6 further wherein the stop member is connected to the adhesive member and includes a tab
7 portion positioned to be engaged by a human digit, the stop member further including an
8 engaging portion positioned in the aperture of the casing, the engaging portion being
9 generally co-planar with the casing when the stop member is in the non-restricting position,
10 the engaging portion being positioned inwardly of the casing and axially aligned with the
11 slider member when the stop member is the restricting position.

1 33. The apparatus of claim 32 wherein an outwardly facing surface of the
2 engaging portion of the stop member is positioned inward from and overlaps an inwardly
3 facing surface of the casing when the stop member is in the restricting position to at least
4 restrict motion of the stop member away from the restricting position.

1 34. The apparatus of claim 31 wherein the percutaneous electrode is
2 supported by a slider member, and wherein the slider member is moveable relative to the
3 housing along the axis, further wherein the stop member is disengaged from the slider
4 member when the stop member is in the non-restricting position and positioned to at least
5 restrict axial motion of the slider member when the stop member is in the restricting position.

1 35. An apparatus for administering percutaneous electrical therapy to a
2 recipient, comprising:

3 a housing supporting a percutaneous electrode in position to penetrate a skin
4 surface of the recipient; and

5 a removable attachment member initially separate from the housing, the
6 attachment member having a first portion with an adhesive upper surface positioned to
7 adhere to the housing, the attachment member further having a second portion with an
8 adhesive lower surface facing away from the upper surface to engage the skin surface, the
9 second portion being coupled to the first portion with a releasable bond, and wherein a tear
10 strength of the releasable bond is less than a tear strength of the first portion and less than a
11 tear strength of the second portion.

1 36. The apparatus of claim 35 wherein the upper surface has a first adhesive
2 and the lower surface has a second adhesive, the first adhesive being configured to form a
3 first bond with the housing, the second adhesive being configured to form a second bond
4 with the skin surface, the second bond being weaker than the first bond.

1 37. The apparatus of claim 35, further comprising a first releasable cover
2 removably attached to the upper surface and a second releasable cover removably attached to
3 the second surface.

1 38. The apparatus of claim 35 wherein the first and second portions of the
2 attachment member are formed integrally with each other and wherein the releasable bond
3 includes perforations between the first and second portions.

1 39. The apparatus of claim 35 wherein the support housing includes a
2 generally cylindrical portion in which the percutaneous electrode is positioned, the housing
3 further including a flange extending radially outwardly from the generally cylindrical portion
4 toward one end of the generally cylindrical portion, and wherein the first portion of the
5 attachment member is shaped to adhesively bond to the flange and the second portion of the
6 adhesive member is positioned radially outwardly from the first portion.

1 40. The apparatus of claim 35 wherein the housing has a generally
2 cylindrical portion and the releasable bond defines a generally arcuate bond line concentric
3 with the generally cylindrical portion.

41. The apparatus of claim 35, further comprising the percutaneous electrode, and wherein the percutaneous electrode is movable relative to the housing between a first position with the percutaneous electrode located within the housing and a second position with the percutaneous electrode at least partially external to the housing to penetrate the skin surface, and wherein the apparatus still further comprises a stop member coupled to the housing and moveable relative to the housing between a non-restricting position and a restricting position, the stop member being operatively decoupled from the percutaneous electrode when in the non-restricting position to allow axial motion of the electrode, the stop member being positioned to at least restrict axial motion of the percutaneous electrode when the stop member is in the restricting position.

42. A method for single-use application of a percutaneous electrode, comprising:

- positioning a housing proximate to a skin surface of a recipient;
- coupling an attachment portion of the housing to the skin surface of a recipient;
- deploying a percutaneous electrode by moving the electrode relative to the housing and through the skin surface of the recipient;
- retracting the electrode from the skin surface and into the housing; and
- detaching the housing from the skin surface and at least substantially disabling the attachment portion from being reattachable to the same or a different recipient.

43. The method of claim 42 wherein detaching the housing includes separating the attachment portion from the skin surface, and further wherein separating the attachment portion from the skin surface occurs simultaneously with substantially reducing the ability of the attachment portion to reattach.

44. The method of claim 42 wherein coupling an attachment portion of the housing to the skin surface includes engaging an adhesive surface with the skin surface, the adhesive surface being coupled to the housing.

1 45. The method of claim 42 wherein detaching the housing includes
2 separating a first portion of the attachment portion from a second portion of the attachment
3 portion along a line of perforations, and separating an adhesive bond between the second
4 portion and the skin surface.

1 46. The method of claim 42 wherein detaching the housing includes
2 separating a first portion of the attachment portion from a second portion of the attachment
3 portion along line having a material thickness less than a thickness of the first portion and
4 less than a thickness of the second portion, and separating an adhesive bond between the
5 second portion and the skin surface.

1 47. The method of claim 42 wherein the first portion of the adhesive
2 member has a first number of plies and the second portion of the adhesive member has a
3 second number of plies, and wherein at least partially separating the first portion of the
4 adhesive member from the second portion of the adhesive member includes tearing the
5 adhesive member in a releasable bond portion of the adhesive member having a third number
6 of plies, the third number being less than the first number and less than the second number.

1 48. The method of claim 42 wherein the first portion of the adhesive
2 member includes a first material and the second portion of the adhesive member includes a
3 second material, and wherein at least partially separating the first portion of the adhesive
4 member from the second portion of the adhesive member includes tearing the adhesive
5 member in a releasable bond portion of the adhesive member having a material weaker than
6 the first material and weaker than the second material.

1 49. The method of claim 42, further comprising positioning a stop member
2 to at least restrict axial motion of the percutaneous electrode after the percutaneous electrode
3 has been retracted to at least substantially reduce an ability of the percutaneous electrode to
4 re-enter a skin surface of the same or a different recipient.

1 50. The method of claim 42 wherein the attachment portion initially defines
2 a generally flat attachment plane and wherein detaching the housing includes deflecting at
3 least part of the attachment portion out of the attachment plane and at least restricting
4 movement of the part of the attachment portion back into the attachment plane.

1 51. The method of claim 42 wherein the attachment portion includes an
2 adhesive surface with a protective cover, and wherein the method further includes removing
3 the protective cover before coupling the attachment portion of the housing to the skin surface
4 of the recipient.

1 52. A method for providing a recipient with a percutaneous electrode
2 housing, comprising:

3 positioning the housing proximate to a skin surface of the recipient, the housing
4 being configured to carry a percutaneous electrode, the housing further having an attachment
5 member with a first portion attached to the housing and a second portion having an adhesive
6 surface;

7 engaging an engaging surface of the housing with the skin surface;

8 adhering the adhesive surface of the attachment member to the skin surface;

9 and

10 detaching the housing from the skin surface by breaking an adhesive bond
11 between the adhesive surface and the skin surface and at least partially separating the first
12 portion of the adhesive member from the second portion of the adhesive member.

1 53. The method of claim 52 wherein at least partially separating the first
2 portion from the second portion includes tearing the attachment member along a line of
3 perforations.

1 54. The method of claim 52 wherein at least partially separating the first
2 portion from the second portion includes tearing the attachment member in a region having a
3 thickness less than a thickness of the first portion and less than a thickness of the second
4 portion.

1 55. A method for providing a recipient with a percutaneous electrode
2 housing, comprising:
3 adhesively bonding a lower surface of an attachment member to a skin surface
4 of the recipient;
5 adhesively bonding the housing to an upper surface of the attachment member;
6 and
7 detaching the housing from the skin surface by breaking an adhesive bond
8 between the attachment member and the skin surface and at least partially separating a first
9 portion of the attachment member from a second portion of the attachment member.

1 56. The method of claim 55, further comprising forming a stronger bond
2 between the upper surface of the attachment member and the housing than between the lower
3 surface of the attachment member and the skin surface.

1 57. The method of claim 55 wherein at least partially separating the first
2 portion from the second portion includes tearing the attachment member along a line of
3 perforations.

1 58. A method for releasably attaching a percutaneous electrode housing to a
2 recipient, comprising:
3 disposing an adhesive on a surface of a housing supporting the percutaneous
4 electrode;
5 adhesively bonding the surface of the housing to a skin surface of a recipient;
6 and
7 detaching the housing from the skin surface by disposing a chemical release
8 agent on at least one of the adhesive, the skin surface and the surface of the housing, and
9 moving at least one of the skin surface and the surface of the housing away from the other.

1 59. The method of claim 58, further comprising selecting the adhesive to
2 include cyanacrylate.

1 60. The method of claim 58, further comprising selecting the chemical
2 release agent to include acetone.

1 61. A method for single-use application of a percutaneous electrode,
2 comprising:

3 positioning a housing proximate to a skin surface of a recipient;
4 attaching an attachment portion of the housing to the skin surface of the
5 recipient;

6 deploying a percutaneous electrode by moving the electrode relative to the
7 housing and through the skin surface of the recipient; and

8 retracting the percutaneous electrode from the skin surface and into the housing
9 and at least restricting an ability of the percutaneous electrode to redeploy through a skin
10 surface of the same or a different recipient.

1 62. The method of claim 61, further comprising detaching the housing from
2 the skin surface of the recipient.

1 63. The method of claim 61 wherein the percutaneous electrode is supported
2 relative to the housing with a slider member and the slider member is movable relative to the
3 housing between a first position with the electrode located within the housing and a second
4 position with the electrode deployed through the skin surface of the recipient, and wherein at
5 least restricting an ability of the percutaneous electrode to redeploy includes axially aligning
6 a stop member with the slider when the slider member is in the first position to at least
7 restrict movement of the slider member away from the first position.

1 64. The method of claim 61 wherein the percutaneous electrode is supported
2 relative to the housing with a slider member and the slider member is movable relative to the
3 housing between a first position with the electrode located within the housing and a second
4 position with the electrode deployed through the skin surface of the recipient, and wherein
5 attaching the attachment member to the skin surface includes adhesively coupling an
6 adhesive surface of the attachment member to the skin surface, still further wherein at least

7 restricting an ability of the percutaneous electrode to redeploy includes moving a first portion
8 of a stop member connected to the attachment member to lift at least part of the adhesive
9 surface from the skin surface and engage a second portion of the stop member with the slider
10 member when the slider member is in the first position to at least restrict movement of the
11 slider member away from the first position.

1 65. The method of claim 61 wherein the attachment portion includes an
2 adhesive surface and attaching the housing to the skin surface of the recipient includes
3 engaging the adhesive surface with the skin surface.

1 66. The method of claim 61 wherein the attachment portion includes an
2 adhesive surface removably bonded to the skin surface of the recipient and wherein the
3 method further comprises detaching the housing from the skin surface of the recipient by
4 separating a first part of the attachment portion connected to the housing from a second part
5 of the attachment portion having the adhesive surface.

1 67. A method for re-using a percutaneous electrode configured for one-time
2 use, comprising:

3 positioning a housing proximate to a skin surface of a recipient;
4 coupling an attachment portion of the housing to the skin surface of the
5 recipient;

6 deploying a percutaneous electrode by moving the electrode relative to the
7 housing and through the skin surface of the recipient;

8 retracting the electrode from the skin surface and into the housing;
9 detaching the housing from the skin surface and at least substantially reducing

10 an ability of the attachment portion to reattach to the same or a different recipient; and

11 reattaching the attachment portion to a skin surface of the same or a different
12 recipient.

1 68. The method of claim 67 wherein the attachment portion includes an
2 adhesive surface and coupling the attachment portion includes engaging the adhesive surface
3 with the skin surface of the recipient.

1 69. The method of claim 67 wherein the attachment portion includes an
2 adhesive surface removably bonded to the skin surface of the recipient, and wherein
3 detaching the housing includes partially separating a first part of the attachment portion from
4 a second part of the attachment portion, and further wherein reattaching the attachment
5 portion to the skin includes connecting the first part of the attachment portion to the second
6 part of the attachment portion.

1 70. The method of claim 67 wherein the attachment portion includes an
2 adhesive surface removably bonded to the skin surface of the recipient, and wherein
3 detaching the housing includes partially separating a first part of the attachment portion from
4 a second part of the attachment portion, and further wherein reattaching the attachment
5 portion to the skin includes connecting the second part of the attachment portion to the
6 housing.

1 71. A method for re-using a percutaneous electrode configured for one-time
2 use, comprising:
3 positioning a housing proximate to a skin surface of a recipient;
4 attaching the housing to the skin surface;
5 deploying a percutaneous electrode by moving the electrode relative to the
6 housing and through the skin surface;
7 retracting the electrode from the skin surface and into the housing;
8 at least substantially disabling redeployment of the electrode into the same or a
9 different recipient; and
10 redeploying the electrode into the same or a different recipient.

1 72. The method of claim 71 wherein the housing includes a slider member
2 supporting the percutaneous electrode and slideable along an axis relative to the housing to
3 deploy the electrode, and wherein at least substantially disabling redeployment of the
4 electrode to redeploy includes moving a stop member relative to the housing from a non-
5 restricting position to a restricting position, with the stop member at least restricting motion
6 of the slider member along the axis in the restricting position, and further wherein

- 7 redeploying the electrode includes moving the stop member away from the restricting
8 position.

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